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WHAT IS CLAIMED IS:

~~1. A method for producing an athermal optical device comprising:~~

providing a negative expansion substrate having an upper surface;

mounting a thermally sensitive, positive expansion optical component onto the substrate upper surface and

affixing the component to the substrate at at least two spaced apart locations.

2. The method according to Claim 1, wherein the substrate comprise a beta-eucryptite glass-ceramic.

3. The method according to Claim 2, in which the beta-eucryptite comprises SiO_2 43-55%, Al_2O_3 31-42%, Li_2O 8-11%, TiO_2 2-6%, and ZrO_4 0-4% on a weight percent basis.

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4. The method according to Claim 1, wherein the component is affixed by a layer of attachment material.

5. The method according to Claim 4, wherein the attachment material is one of a polymer, a frit and a metal.

6. The method according to Claim 1, in which the optical component is an optical fiber grating.

7. The method according to Claim 1, in which the optical component is an optical fiber coupler, the coupler comprising at least two optical fibers fused together at one or more points along their lengths.

8. The method according to Claim 1, in which the optical component is a waveguide.

9. The method according to Claim 8, in which the waveguide is a planar

waveguide.

10. A method for producing an athermal optical fiber grating device comprising:

providing a negative expansion substrate having an upper surface and first and second ends;

mounting an optical fiber with at least one grating defined therein onto the substrate upper surface such that the grating lies between and at a distance from each end; and

affixing the optical fiber to the substrate at at least two spaced apart locations.

11. The method according to Claim 10, further comprising applying a sufficient tension to the optical fiber before the affixing step to maintain the fiber under tension at all anticipated use temperatures.

12. The method according to Claim 10, wherein the optical fiber is affixed to the substrate upper surface at a location between the grating and the first end and at a location between the grating and the second end.

13. The method according to Claim 12, wherein the fiber is affixed by a layer of attachment material.

14. The method according to Claim 14, wherein the attachment material is one of a polymer, a frit and a metal.

15. The method according to Claim 14, wherein the polymer is an epoxy adhesive.

16. The method according to Claim 12, wherein the affixing step comprises; bonding a pad of material having a coefficient of expansion intermediate between that of the fiber and the substrate to the upper substrate surface at each affixing location and affixing the fiber to each pad.

17. The method according to Claim 12, wherein the fiber is cushioned along substantially the entire length of the fiber between the affixing locations by a low-modulus damping material.

18. The method according to Claim 12, wherein the substrate has a channel formed at each of the affixing locations of the upper surface sized to receive the fiber at a temperature lower than any anticipated use of the device and to clamp on the fiber at a normal use temperature range, further comprising;

cooling the substrate to the lower temperature;

inserting the fiber in each channel; and

warming the substrate to the normal use temperature range to clamp the fiber.

19. The method according to Claim 10, wherein the substrate comprise a beta-eucryptite glass-ceramic.

20. The method according to Claim 19, in which the beta-eucryptite comprises SiO_2 43-55%, Al_2O_3 31-42%, Li_2O 8-11%, TiO_2 2-6%, and ZrO_4 0-4% on a weight percent basis.

21. A method for producing an athermal optical fiber grating device comprising:

providing a negative expansion substrate having an upper surface and first and second ends;

mounting a photorefractive-sensitive optical fiber onto the substrate upper surface;

applying a sufficient tension to the optical fiber to maintain the fiber under tension at all anticipated use temperatures;

affixing the optical fiber to the substrate at at least two spaced apart locations; and

exposing the optical fiber to UV light in order to define at least one optical grating therein such that the grating lies between and at a distance from each end either before or after the mounting step.

22. The method according to Claim 21, wherein the substrate comprise a beta-eucryptite glass-ceramic.

23. An athermal optical device comprising:

a negative expansion substrate having an upper surface;

a thermally sensitive, positive expansion optical component affixed to the substrate upper surface at at least two spaced apart locations.

24. The device according to Claim 23, in which the substrate comprises a beta-eucryptite glass-ceramic.

25. The device according to Claim 24, in which the beta-eucryptite comprises SiO_2 43-55%, Al_2O_3 31-42%, Li_2O 8-11%, TiO_2 2-6%, and ZrO_4 0-4% on a weight percent basis.

26. The device according to Claim 23, in which the optical component is an optical fiber grating.

27. The device according to Claim 23, in which the optical component is an optical fiber coupler, the coupler comprising at least two optical fibers fused together at one or more points along their lengths.

28. The device according to Claim 23, in which the optical component is a waveguide.

29 The device according to Claim 28, in which the waveguide is a planar waveguide.

30. An athermal optical fiber grating device comprising;

a negative expansion substrate having an upper surface and first and second ends;

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an optical fiber affixed to the substrate upper surface at at least two spaced apart locations; and

a grating defined in the optical fiber between and at a distance from each substrate end.

31. The device according to Claim 30, in which the optical fiber is affixed to the substrate upper surface at first and second spaced apart locations, the first location is between the grating and the first substrate end and the second location is between the grating and the second substrate end.

32. The device according to Claim 30, wherein the fiber is affixed by a layer of attachment material.

33. The device according to Claim 32, in which the attachment material is one of a polymer, a frit and a metal.

34. The device according to Claim 33, in which the polymer is an epoxy adhesive.

35. The device according to Claim 31, further comprising a bonding pad having a coefficient of expansion intermediate between that of the fiber and the substrate mounted between the optical fiber and the substrate at each of the first and second locations, the optical fiber being bonded to each bonding pad and each bonding pad being affixed to the substrate.

36. The device according to Claim 31, further comprising a low modulus damping material connected to substantially the entire length of the fiber between the affixing locations.

37. The device according to Claim 31, in which each affixing location comprises a channel sized to receive the fiber at a temperature lower than any anticipated use of

the device and to clamp on the fiber at normal use temperatures.

38. The device according to Claim 30, in which the substrate comprises a beta-eucryptite glass-ceramic.

39. The device according to Claim 38, in which the beta-eucryptite comprises SiO_2 43-55%, Al_2O_3 31-42%, Li_2O 8-11%, TiO_2 2-6%, and ZrO_4 0-4% on a weight percent basis.

40. The device according to Claim 39, in which the beta-eucryptite has a ~~negative coefficient of thermal expansion between -30 x 10^{-7}/°C and -90 x 10^{-7}/°C.~~